

Radiation Hard, High Efficiency, Quadruple Junction Solar Cells Based on InGaAsN, Phase I

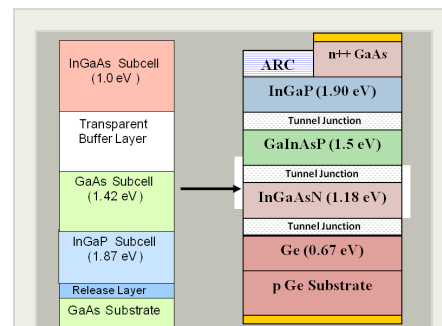
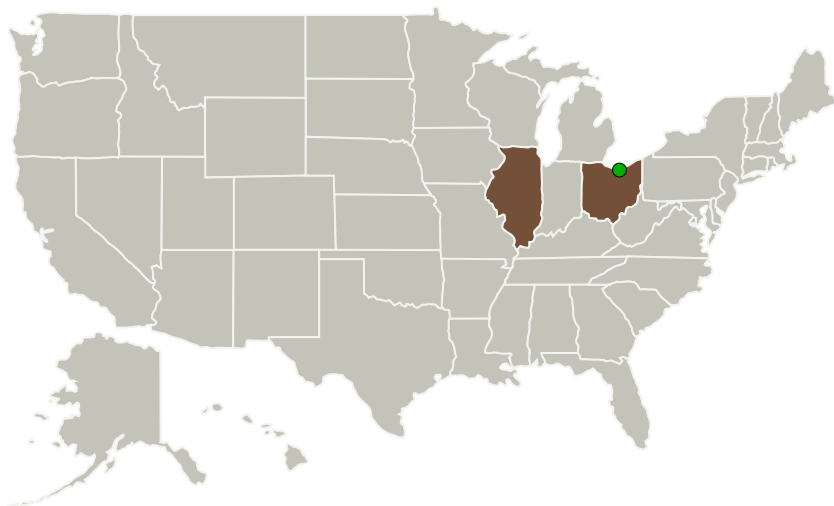
Completed Technology Project (2015 - 2015)



Project Introduction

The proposed innovation is the development of a technology that will enable the manufacture of high-efficiency (>40%), quadruple(4) junction solar cells on lightweight Ge substrates. We plan to achieve this objective by developing a new semiconductor alloy, InGaAsN, which will be employed as the 1.18 eV bottom cell in quadruple-junction [InGaP (1.8 eV) / GaInAs P(1.5 eV) / InGaAsN (1.18 eV) / Ge (0.67eV)] solar cells. The InGaAsN alloy material will be lattice matched to Ge, which is a clear improvement over existing inverted metamorphic (IMM) technology, specifically, the existing lattice-mismatched InGaAs 1.0 eV bottom cell is replaced with a lattice-matched InGaAsN 1.18 eV bottom cell. This eliminates the need to grow a thick graded buffer layer. Another advantage of this system is higher efficiency and higher reliability solar cells which can effectively be a drop in replacement to the existing Ge based space cells. At the end of this project, we expect to have developed and integrated InGaAsN - 1.18 eV material, which can be used in Ge-based multi-junction cells that have the potential to achieve efficiencies in excess of 40% at AM0, one sun illumination.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
MicroLink Devices, Inc.	Lead Organization	Industry Minority-Owned Business	Niles, Illinois
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Illinois	Ohio
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Project Transitions

**June 2015:** Project Start**December 2015:** Closed out

Closeout Summary: Radiation hard, high efficiency, quadruple junction solar cells based on InGaAsN, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139362>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

MicroLink Devices, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

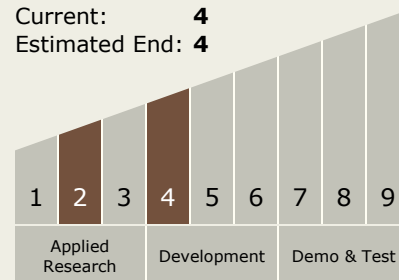
Sudersena Rao Tatavarti Bharatam

Technology Maturity (TRL)

Start: 2

Current: 4

Estimated End: 4

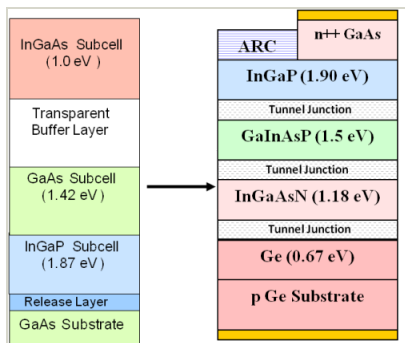


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Images



Briefing Chart Image

Radiation hard, high efficiency, quadruple junction solar cells based on InGaAsN, Phase I
(<https://techport.nasa.gov/image/127207>)

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.1 Power Generation and Energy Conversion
 - └ TX03.1.1 Photovoltaic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System